Reiter," and—curious association—two short notices relating to the Emperor William I. These deal with the Frankfort Congress of 1863, and with episodes in 1870 at Ems, and at Sedan. The notes of the conversation with the French Ambassador Benedetti at the former place (July 13 and 15, 1870), and with Napoleon III. at the latter place (September 2, 1870), are of historical interest, and are among the few papers of permanent value contained in the book.

The price of the brochure, which is issued in paper covers, is stated to be 100 marks, which, considering the present value of German currency, is not excessive, however significant of Germany's financial straits. The book is admirably printed on excellent paper, and is suitably illustrated. It does credit, in fact, to the eminent firm by which it is published. The war and its consequences have evidently had no detrimental effect on the typographical excellence of book production in Germany.

Fish Preservation.

Fisheries—England and Wales. Ministry of Agriculture and Fisheries. Fishery Investigations: Series 1, Freshwater Fisheries and Miscellaneous. Vol. 2, No. 1, *The Methods of Fish Canning in England.* Pp. 25. (London: H.M. Stationery Office, 1921.) 2*s.* 6*d.* net.

THE development of methods of preserving fish was a matter of national importance during the war, and the present account is founded on investigations started in that period. The fish used for canning are mostly surface-feeding and living fish, such as sprats (or bristling), sardines (or pilchards), tunny and bonito, herring and mackerel, the only other fish of any importance being the salmon caught in America on its migration to fresh water for breeding. Of British fish there is a great excess of herring in the normal fisheries, and, given suitable fishing gear, large quantities of sprats can also be obtained on all coasts. Mackerel are at times abundant, but there is little certainty of heavy catches year by year; pilchards are local to Cornwall, and the immature forms (sardines), so extensively tinned in France, Spain, and Portugal, are not caught in quantity. There was one British sprat cannery before the war, but herrings were put up at the great herring ports in oil or with tomato, the product being in some cases excellent. Excess sprats were generally used for manure, while herrings were salt-pickled and barrelled for export, the price being two or three for a penny. The latter is an "unspeakable" product, which has never found favour in this country, and fresh methods of preservation are urgently requisite for the utilisation of herrings as a cheap form of food. The markets, too, of Central and East Europe, which took most of this product, are disorganised, and it is doubtful whether they can ever be recreated, as there would seem to be a real improvement in Continental taste, brought about by the temporarily improved food conditions of the war.

The success of different kinds of fish as canned products depends largely on the fat which lies under the skin and between the muscles. Salmon is canned or frozen in air (dry frozen) on the Pacific coast almost immediately when caught, certainly before *rigor mortis* has set in; the same is, to some degree, true also of the Norwegian sprats (bristling), of which there are about eighty factories in operation. The difficulty in Great Britain is that no port has a herring or sprat season extending through more than three or four months, and a factory with modern appliances and trained packers cannot be run profitably for such a short season. The fish required at other times must be brought in by rail, and this doubles the cost, while the actual fish has passed through its *rigor* and is deteriorating. It would seem necessary to get the fish as fresh as possible and to discover some method of preservation in bulk for subsequent packing, the process being one which would in no wise alter its composition or flavour.

Experiments with brine freezing and subsequent cold storage are described, but difficulty was experienced in the caking of sprats into masses and the salting, due both to the small size of the fish and to an excessive cold-store temperature "just under 30° F." Both these difficulties might perhaps be got rid of, but the total cost of the actual freezing, storage, transport, etc., would probably average 3*d.* per lb., which only a first-rate product could bear. Unfortunately, British sprats, as at present caught, are shown to be by no means such a product, being indeed much inferior to the Norwegian. According to the tables, they varied in fat from 5 to 23 per cent., protein being 15 to 20 per cent., ash about 1·5 per cent., the rest being water, which, with fat, roughly forms 80·5 per cent. The problem is to catch sprats of the right composition for pickling. The English fish is winter and spring caught, while the Norwegian fishery is in summer and autumn. The reproductive cycle has doubtless something to do with the quality, but little is as yet known of the life-history of the English fish. The difference lies probably, not in the fat contents, but in other

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qualities, the winter fish being of inferior taste and texture. Clearly we must either continue to pack a second-rate product, or discover where our sprats go to in summer, invent methods of catching them, and finally adopt more "fastidious" methods of handling, all of which Dr. Johnstone clearly considers could be accomplished by further research. In contradistinction to the sprat our summer herring is said to be second to none.

After canning the flavour of the fish improves notably, the raw taste disappearing, the bones softening, and the flesh breaking easily; this is what is called "maturation," and the time required is from six months to as many years to give the best product. No suggestions or experiments to ascertain the cause of this proved satisfactory. It would not seem to be autolysis, for storage at a temperature of 37° C. did not hasten the process. Bacterial change is considered more likely, as spores can withstand a temperature of 150° C. if present in oil. Catalysis, however, cannot be ruled out, as the tin of the container is always to some degree dissolved. The whole question of "maturation" in respect to all canned foods is, as Dr. Johnstone says, "of huge practical importance—and of remarkable obscurity." It is certain that no commercial product can be stored for from three to six years and then sold cheaply.

The whole report is immature, in that the investigations were never made on a sufficient scale to be economically of value, and were prematurely closed down. It seems doubtful whether they can profitably be restarted until basal investigations, such as on the nitrogenous composition of the protein of fish in respect to phases of reproductive activity and to the formation of fat, are completed. On freezing and maturation the Food Investigation Board,[1] in the midst of other investigations, had been conducting researches for three years, but it is quite clear that there is plenty of room for less "directed" researches. Either the Fishery Boards should take up the whole problem, directly or through the Food Investigation Board, and vigorously prosecute it—even employing bounties if necessary—with a determination to create a new industry of value to an island nation, or drop it altogether. The Scottish Fishery Board made the export of salt herrings—in 1913 8,795,232 cwts. of value 5,331,042*l.*—a valuable British industry, by pursuing a consistent, steady policy through several decades. In the twentieth century Government officials seem to have little of the imagination required or to be afraid of the fluctuations of political affairs. They need not be, for surely these developments are national and not political, and such as "the man in the street"—and in the Commons—requires.

J. STANLEY GARDINER.

Our Bookshelf.

The Microtomist's Vade-Mecum: A Handbook of the Methods of Microscopic Anatomy. By A. B. Lee. Eighth edition. Edited by Prof. J. B. Gatenby, with the collaboration of Prof. W. M. Bayliss and others. Pp. x+594. (London: J. and A. Churchill, 1921.) 28*s.* net.

THE new edition of this well-known work of reference has been completely revised by Prof. Gatenby, who has had the assistance of experts in various branches of microscopical technique, and the result is a volume which is practical, critical, and thoroughly up-to-date. Prof. W. M. Bayliss has rewritten the chapter on staining, and his concise account of the nature of staining and of differentiation gives a clear conception of the physico-chemical facts on which these processes are based. Dr. C. Da Fano has been responsible for the five chapters on neurological technique, which form 100 pages of the book and contain many suggestions drawn from his extensive experience. Dr. A. Drew has rewritten the section on Protozoa, which, in addition to the methods for fixation, staining, etc., gives an account of cultural methods for amœbæ; Dr. W. Cramer contributes a dozen pages on the micro-technique of fatty substances, including a useful summary of the methods to be employed in a complete histochemical investigation of fatty cell-inclusions; and Mr. J. T. Carter has revised the account of methods for the study of teeth and bone. The remainder of the work has been in Prof. Gatenby's hands, and the sections on fixation, chromatin, nucleoli, mitochondria, and the Golgi apparatus are especially noteworthy and helpful in suggestions; mention should also be made of the short account of methods of tissue culture *in vitro,* which, in the hands of Ross Harrison and his successors, have given such remarkable results. The last chapter has been written for the beginner and gives clear directions for carrying through the preparation of a whole mount of a Daphnia, for making sections of muscle or other tissue of a vertebrate, and for preparing a tadpole for serial sections.

Two recent methods for staining bacteria have been introduced to help those who may be doubtful whether certain bodies in tissue are or are not bacteria. Having gone so far, the editor might perhaps consider whether he could include in the next edition the methods for the study of spirochætes which zoologists nowadays frequently find it necessary to examine. Under Annelids a reference to the preparation and mounting of chætæ would also be a useful additior

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[1] See Report for 1920. (H.M. Stationery Office.) 1*s.*

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